Patellar Component Design Does Not Impact Clinical Outcomes in Primary Total Knee Arthroplasty

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INTRODUCTION: Round or oval implants are routinely used in patellar resurfacing during total knee arthroplasty (TKA). However, it is unclear whether component geometry affects clinical outcomes. The purpose of this study is to determine if one implant shape confers superior outcomes to the other.

METHODS:

A retrospective review of primary TKA cases performed between October 2016 and January 2020 was conducted at an urban, tertiary academic center. Cases were included if a surgeon used the same patellar design for 50 consecutive cases before (round) and 50 consecutive cases after (oval) the surgeon switched patella type. Baseline demographic data as well as pre- and postoperative radiographic measurements (Insall-Salvati Index (ISI), lateral patellar tilt, distal femoral angle, and proximal tibial angle) were collected and compared. Surgical data, reasons for revision, and patient reported outcome measures (PROMs) were also analyzed. Independent samples t-test and chi-squared test were used to compare means and proportions, respectively, between the two cohorts.

RESULTS:

A total of 400 consecutive, primary TKAs were included in this analysis. There were no demographic differences between the groups (p>0.05). There was no statistically significant difference between the preoperative patellar tilt, ISI, femoral angle, or tibial angle between the two groups**.** While the difference in postoperative patellar tilt was statistically significant between the groups (11.41 ± 5.06 vs. 13.82 ± 5.73, p<0.001), there was no difference in ISI, femoral angle, or tibial angle. Sixteen patients required revision surgery (p=0.656). Of the nine patients with round patellas, reasons for revision were infection (2), knee instability (2), patellar instability (1), quadriceps tendon rupture (1), aseptic tibial/femoral loosening (1), arthrofibrosis (1), and tibial component malposition (1). Of the nine, only one patella button was revised. Of the seven patients with oval patellas, reasons for revision were infection (1), knee instability (1), patellar instability (1), quadriceps tendon rupture (1), patellar loosening (1), and arthrofibrosis (2). Of the seven, only two patella buttons were revised. VR-12 PCS at three-months postoperatively was higher for the round group (44.08 ± 7.73 vs. 40.25 ± 7.61, p=0.001).

DISCUSSION AND CONCLUSION:

While radiographic patellar tilt was different between the cohorts, there was no clinical correlation in function or outcomes at three-months or one-year postoperatively. Long-term follow-up studies are needed to evaluate the implications of patellar component design on outcomes and function, but either design is effective for resurfacing.

Table 1: Demographic Comparison

	Round (n=200)	Oval (n=200)	P-Value
Age	66.13	67.80	0.088
Sex			0.346
Male- no. (%)	125 (62.5%)	134 (67%)	
Female- no (%)	75 (37.5%)	66 (33.0%)	
BMI	31.78	31.91	0.821
Smoking Status- no. (%)			0.810
Never	110 (55.0%)	113 (56.5%)	
Former	83 (41.5%)	787 (39.0%)	
Current	7 (3.5%)	9 (4.5%)	
Race- no. (%)			0.877
White	120 (61.5%)	117 (60.0%)	
African American	42 (21.5%)	39 (20.0%)	
Asian	7 (3.6%)	9 (4.6%)	
Other	28 (13.3%)	30 (15.4%)	
ASA Class- no. (%)			0.403
I	5 (2.5%)	2 (1.0%)	
II	107 (53.5%)	96 (48.0%)	
III	84 (42.0%)	97 (48.5%)	
IV	4 (2.0%)	5 (2.5%)	

Table 2: Radiographic Measurement Comparison

		Round (n=200)	Oval (n=200)	P-Value
		Mean (SD)	Mean (SD)	
Pre-Operation	**Patellar Tilt**	12.85 (5.73)	13.00 (5.12)	0.572
	ISI	0.94 (0.22)	1.00 (0.49)	0.158
	Femoral Angle	83.58 (4.04)	83.18 (7.11)	0.365
	Tibial Angle	89.54 (8.32)	89.65 (7.83)	0.907
Post-Operation	**Patellar Tilt**	11.41 (5.06)	13.82 (5.73)	**<0.001***
	ISI	1.56 (4.82)	1.34 (2.09)	0.555
	Femoral Angle	84.86 (7.04)	84.90 (6.75)	0.872
	Tibial Angle	89.88 (5.12)	90.05 (2.45)	0.729

Table 3: Surgical Variable Comparison

	Round (n=200)	Oval (n=200)	P-Value
Surgical Time (minutes)	99.1 (SD 31.6)	103.0 (SD 28.9)	0.313
LOS (days)	2.73	2.30	**0.005***
Discharge Disposition- no. (%)	200 (100%)	200 (100%)	0.146
Home	173 (86.5%)	168 (84.0%)	0.418
Skilled Nursing Facility	22 (11.0%)	19 (9.5%)	0.761
Acute Rehab Center	5 (2.5%)	13 (6.5%)	0.058
Revision- no. (%)	9 (4.5 %)	7 (3.5 %)	0.656
Infection	2 (1.0 %)	1 (0.5 %)	0.525
Knee Instability	2 (1.0%)	1 (0.5%)	0.875
Patellar Instability	1 (0.5%)	1 (0.5%)	0.813
Quadriceps tendon rupture	1 (0.5%)	1 (0.5%)	0.987
Femoral and tibial loosening	1 (0.5%)	0 (0.0%)	0.992
Patellar loosening	0 (0.0%)	1 (0.5%)	0.994
Arthrofibrosis	1 (0.5%)	2 (1.0 %)	0.625
Tibial component malposition	1 (0.5%)	0 (0.0 %)	0.994
Components revised- no. (%)			0.654
Femur	1 (0.5)	3 (1.5)	0.340
Tibia	2 (1.0)	3 (1.5)	0.629
Liner	7 (3.5)	6 (3.0)	0.877
Patella	1 (0.5)	2 (1.0)	0.514

LOS, length of stay; SD, standard deviation, no., number.
*p<0.05

Table 4: PROMs Analysis

	Round (n=200)	Oval (n=200)	P-Value
KOOS, JR			
Preop	49.48±11.84 (n=7)	40.65±14.67 (n=53)	0.043
3m	61.64±17.15 (n=67)	60.96±18.75 (n=109)	0.848
1y	63±88 (n=33)	69.67±18.59 (n=82)	0.199
VR-12 PCS			
Preop	33.58±9.74 (n=17)	33.81±9.57 (n=65)	0.808
3m	44.08±7.73 (n=81)	40.25±7.61 (n=118)	**0.001***
1y	44.99±9.80 (n=16)	42.12±7.66 (n=85)	0.136
VR-12 MCS			
Preop	50.14±11.36 (n=17)	48.70±12.86 (n=65)	0.620
3m	50.64±9.52 (n=81)	51.02±9.01 (n=117)	0.943
1y	55.22±10.10 (n=16)	52.02±9.31 (n=85)	0.233